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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte GAYATRI VYAS,
Hubert A. Gasteiger, Youssef Mikhail, and Ilona Busenbender

Appeal 2010-001012
Application 10/689,001
Technology Center 1700

Before TERRY J. OWENS, BEVERLY A. FRANKLYN, and
MARK NAGUMO, *Administrative Patent Judges.*

NAGUMO, *Administrative Patent Judge.*

DECISION ON APPEAL[1]

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[1] The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, or for filing a request for rehearing, as recited in 37 C.F.R. § 41.52, begins to run from the "MAIL DATE" (paper delivery mode) or the "NOTIFICATION DATE" (electronic delivery mode) shown on the PTOL-90A cover letter attached to this decision.

A. Introduction[2]

Gayatri Vyas, Hubert A. Gasteiger, Youssef Mikhail, and Ilona Busenbender ("Vyas") timely appeal under 35 U.S.C. § 134(a) from the final rejection[3] of claims 1-22 and 55-58.[4] We have jurisdiction under 35 U.S.C. § 6. We REVERSE for the reasons well-stated by Vyas in the principal Brief and in the Reply.

The subject matter on appeal relates to solid polymer electrolyte ("SPE") fuel cells in which an electrode in contact with the SPE is coated with an electrically conductive doped metal oxide composition. The coating is said to protect the electrode from reactant gases such as pressurized oxygen or hydrogen and from acids in the hot and highly corrosive environment of an operating fuel cell. According to the 001 Specification, many metal oxides are known to be passivating, but also to be highly electronically resistive, and therefore undesirable because they increase the internal resistance of the fuel cell and reduce the performance. (Spec. 3-4, [0007].) In a preferred embodiment, the doped metal oxide is said to be fluorine-doped tin oxide. (*Id.* at 6 [0013].)

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[2] Application 10/689,001, *Electrical Contact Element and Bipolar Plate*, filed 20 October 2003, claiming the benefit of an application filed 1 March 2002, now abandoned, and of an application 25 October 2001, now abandoned. The specification is referred to as the "001 Specification," and is cited as "Spec." The real party in interest is listed as GM Global Technology Operations, Inc. (Appeal Brief, filed 13 July 2009 ("Br."), 4.)

[3] Office action mailed 9 March 2009 ("Final Rejection"; cited as "FR").

[4] Claims 23-25 and 29-53 have been withdrawn from consideration and are not before us. (FR 1; Br. 6.)

Representative Claim 1 reads:

1. A fuel cell comprising:

a solid polymer electrolyte having a permeable body containing a cation exchange membrane;

an electrode in electrical communication with said electrolyte; and

an electrically conductive contact element having a major working surface facing said electrode that defines a plurality of reactant gas channels separated by a plurality of lands, said electrically conductive contact element having an electrically conductive coating deposited on and contiguously covering said plurality of lands of said major working surface, wherein

said electrically conductive coating includes a doped metal oxide composition which has a resistivity of less than .001 ohm-cm, and wherein said electrically conductive coating provides electrical conductivity between said plurality of lands and said electrode, and wherein said coating provides a protective layer on said contact element from direct contact with a reactant gas in said plurality of reactant gas channels.

(Claims App., Br. 35; indentation, paragraphing, and emphasis added.)

The Examiner has maintained the following grounds of rejection:[5]

A. Claims 1-3, 13-15, 18-22, and 55-58 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Li[6] and Gordon.[7]

[5] Examiner's Answer mailed 18 August 2009 ("Ans.").

[6] Yang Li et al., *Corrosion Resistant PEM Fuel Cell*, U.S. Patent 5,624,769 (1997).

B. Claims 1, 2, and 55-57 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Gyoten[8] and Gordon.

C. Claims 4-12, 16, and 17 stand rejected under 35 U.S.C. § 103(a) in view of the combined teachings of Li, Gordon, and admitted prior art.[9]

B. Discussion

Findings of fact throughout this Opinion are supported by a preponderance of the evidence of record.

Vyas argues the Examiner failed to establish a reasonable basis to conclude that a person having ordinary skill in the fuel cell art would have used fluorine-doped tin oxide conductive electrodes (taught by Gordon to be useful on glass substrates in electro-optical devices) as covering layers on the electrodes in the high temperature corrosive environments of the fuel cells taught by Li or by Gyoten. (Br. 14-16; Reply 5-6.) Vyas also argues that the Examiner erroneously found that Li teaches or suggests a metal-oxide coating in direct contact with the electrode part of a membrane electrode assembly. (Br. 12.) In Vyas's view, the titanium-nitride top-coat covering the electrodes described by Li results in the formation of a thick,

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[7] Roy G. Gordon, *Method of Depositing Electrically Conductive, Infra-Red Reflective, Transparent Coatings of Stannic Oxide*, U.S. Patent 4,146,657 (1979).

[8] Hisaaki Gyoten et al., *Polymer Electrolyte Fuel Cell*, U.S. Patent 7,005,205 B1 (28 February 2006), based on an international application accorded a date of 26 February 2002 under 35 U.S.C. § 371(c) (1), (2), and (4).

[9] Spec. ¶¶ [0075]-[0077].

passivating, nonconductive metal oxide in micro-discontinuities of the Ti-N. (*Id.* at 13.) Such a non-continuous deposition of metal oxide would not, Vyas argues, be understood by persons skilled in the art to be a "coating" on the electrode. (*Id.*) Similarly, according to Vyas (*id.* at 30-31), Gyoten teaches a conventional approach to fuel cell electrodes, in which steps are taken to minimize the presence (and thus, the formation) of a metal oxide on the conductive elements of a fuel cell. Such metal oxides are known generally to be highly resistive, and hence to degrade the performance of fuel cells.[10] Vyas concludes that the Examiner failed to show that the applied prior art would have suggested coating the metal electrodes in the fuel cells of Li or of Gyoten with the fluorine-doped tin oxides coatings taught as electrodes by Gordon. (*Id.* at 27-28 and 32.)

Vyas's arguments are supported throughout by citations to a declaration by Mr. Gayatri (Vyas) Dadheech,[11] the lead co-inventor of the appealed claims. Mr. Vyas testifies that his academic background is in Chemistry and Material Science, and that he has worked in the automotive industry for 14 years and with fuel cells as a fuel cell engineer since 1997. (Vyas Decl. 1-2, ¶¶ 1-4.) Although, as Vyas candidly admits (Reply 5), the testimony of an applicant may be less persuasive than that of a disinterested

[10] Gyoten describes the formation of CrO_2 on a stainless steel electroconductive separator, which increases the corrosion resistance, but which also increases the contact resistance of the metal substrate. (Gyoten, col. 1, l. 60 to col. 2, l. 1.) In Gyoten's words, "High-output cells consequently cannot be procured." (*Id.* at col. 2, ll. 1-2.)

[11] Declaration filed 21 February 2008 and presented in the Evidence Appendix to the principal Brief on Appeal ("Vyas Decl.").

person, Mr. Vyas testifies, in the parts most relevant to the critical issues in this appeal, to the teachings of the references and their significance to persons having ordinary skill in the art. The Examiner has not come forward with any credible evidence or reason to doubt the accuracy or pertinence of Mr. Vyas's testimony. On the present record, we find the testimony of Mr. Vyas credible and unrebutted.

It is generally obvious to substitute one material for another in an article of manufacture when both materials share common properties, and when it would have been expected that the substitution would result in an article useful for a similar purpose. It appears that the Examiner attempted to demonstrate that such was the case with the fluoride-doped tin oxide layers deposited on glass substrates taught by Gordon to be useful as electrodes in electro-optical devices. As Vyas points out (Br. 15-16, 22-23, and 31-32), however, the Examiner has not shown that a person having ordinary skill in the art would have reasonably expected the tin oxide coatings taught by Gordon to be either useful or successfully coated on the metal substrates of Li or Gyoten. The Examiner's focus on the scope of the appealed claims (Ans. 23), while commendable in general, leads to error when, as here, sufficient attention is not given to the requirements of the references that are to be modified. Here, the Examiner failed to show that electrodes in fuel cells are sufficiently similar to the electrodes taught by Gordon that persons having ordinary skill in the art would have considered the proposed substitution obvious.

Similarly, and again commendably, the Examiner sought to analyze Li and Gyoten for evidence regarding the characteristics of the oxide layers

both disclose. However, as Vyas explains convincingly, the weight of the evidence indicates that the metal oxide layers formed on the fuel cell electrodes described by Li and Gyoten are highly resistive, and that both Li and Gyoten sought to minimize their formation. Li, in particular, sought to change the physical distribution of the metal oxide to minimize the debilitating increase in internal resistance of the fuel cell electrodes.

The Examiner's reliance on additional evidence to reject additional dependent claims does not cure the defects of the primary rejections. We conclude that the Examiner has failed to establish a factual basis for the obviousness rejections of record.

C. Order

We REVERSE the rejection of claims 1-3, 13-15, 18-22, and 55-58 under 35 U.S.C. § 103(a) in view of the combined teachings of Li and Gordon.

We REVERSE the rejection of claims 1, 2, and 55-57 under 35 U.S.C. § 103(a) in view of the combined teachings of Gyoten and Gordon.

We REVERSE the rejection of claims 4-12, 16, and 17 under 35 U.S.C. § 103(a) in view of the combined teachings of Li, Gordon, and admitted prior art.

REVERSED

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